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Effect of pruning and plant growth retardants spray on flower quality parameters of *Jasminum sambac* (L.)

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Abstract
An experiment on "Flower quality in *Jasminum sambac* (L.) as influenced by pruning and plant growth retardant spray" was carried out at the Department of Floriculture and Landscaping, Tamil Nadu Agricultural University, Coimbatore to find out the ideal pruning time, growth retardants and also its concentration to improve the flower quality parameters of *Jasminum sambac* (L.) during off-season flowering. The flower quality parameters *viz.*, total length of flower bud (2.64 and 2.85 cm), length of flower bud without corolla tube (1.37 and 1.47 cm), corolla tube length (1.27 and 1.38 cm) and diameter of flower bud (0.87 and 1.00 cm) were influenced significantly in plants pruned during last week of September along with foliar spray of MC @ 150 ppm. There is no interaction effect between pruning and growth retardant spray for these parameters. The biochemical parameters *viz*., chlorophyll index (48.42, 52.49 and 59.77 SPAD value), total phenol content (1.77, 2.11 and 2.48 mg g^{-1}) and soluble protein (13.49, 14.55 and 16.95 mg g^{-1}) were significantly influenced by pruning during last week of September along with foliar spray of MC @ 150 ppm. The interaction effect was also significantly influenced in plants pruned during last week of September along with foliar spray of MC @ 150 ppm against the flowering parameters.

Keywords: Jasmine, pruning, growth retardants, total length of flower bud, corolla tube length

1. Introduction
Jasminum sambac (L.) is one of the most important commercial traditional flower crops of South India belonging to the family Oleaceae. The flower is used for making garlands, bouquet, decorating hair of women, religious offering etc. It is also used for production of jasmine concrete which is used in cosmetic and perfumery industries. The term jasmine is probably derived from the Persian word "Yasmin" meaning "fragrance". The prices are higher during religious auspicious days (festival season and marriages), Tuesday and Friday of the week. Its demand is constant throughout the Tamil calendar year except Chitrai and Aadi (April- May, July-August). Generally, each farmer usually grows 100 to 250 plants depending upon the family members involved in plucking of flowers. The flowering of jasmine continuous throughout the year and the farmers prune the plants during November to produce new flowering shoots. The market price during December to March is 10 times higher than the remaining part of the year. The exorbitant peak price is mainly due to the non availability of flowers during November to February. So, the farmers are ready to prune the plants in early winter months to get flowers during off season (Krishnamoorthy, 2014) [1]. After pruning, the jasmine plants starts bearing and produce large quantity of flowers during June-July which results in reduced market price during this period which sometimes not even equal to its picking cost. Regulation of plant growth and development using natural plant hormones for greater production has received the utmost attention. Regulation of flowering in jasmine has immense practical value. If the timing of the flowering is getting coincide with the time of greatest demand by modifying the flowering sequence would confer great advantage to the grower and consumers. By knowing the demand during off season this study was taken up with four pruning times and three plant growth retardants at different concentrations to regulate the flower production during off season.

2. Materials and Methods

The trail was carried out at the Botanic Gardens, Department of Floriculture and Landscaping, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The experiment was laid out by adopting Factorial Randomized Block Design which was replicated twice with four different times of pruning along with spray of growth retardants. The *Jasminum sambac* cuttings were planted in the main field with the spacing of 1.25 × 1.25 m. Recommended dose of NPK (60: 120: 120 g per plant per year) and other inputs were applied at appropriate times. Pruning operation was done during last week of August, September, October and November at the level of 45 cm above the ground level. The growth retardants *viz*., CCC @ 500, 1000 and 1500 ppm, PBZ @ 100, 200 and 300 ppm, MC @ 50, 100 and 150 ppm were used in this study. Chloro choline chloride and mepiquat Chloride were applied as foliar spray and paclobutrazol was applied as soil drenching to the respective plots as per the treatment schedule on fifteen days after pruning. The pruned plants were observed for flower quality parameters *viz.*, total length of flower bud, length of flower bud (without corolla tube), corolla tube length and diameter of flower bud and the bio chemical parameters *viz.*, Chlorophyll index, total phenol content and soluble protein in five randomly selected and tagged plants per replication in each treatment were observed. The statistical analysis was done following the method of Panse and Sukhatme (1978) [2].

3. Results and Discussion

3.1. Effect of pruning and plant growth retardants on flower quality characters of *Jasminum sambac* (L.)

The data pertaining to the flower quality characters is furnished in Fig. 1 and Table 1. Both pruning and foliar spray of plant growth retardants showed significant effect but their interaction was not significant for the flower quality parameters *viz*., total length of flower bud, length of flower bud (without corolla tube), corolla tube length and diameter of flower bud.

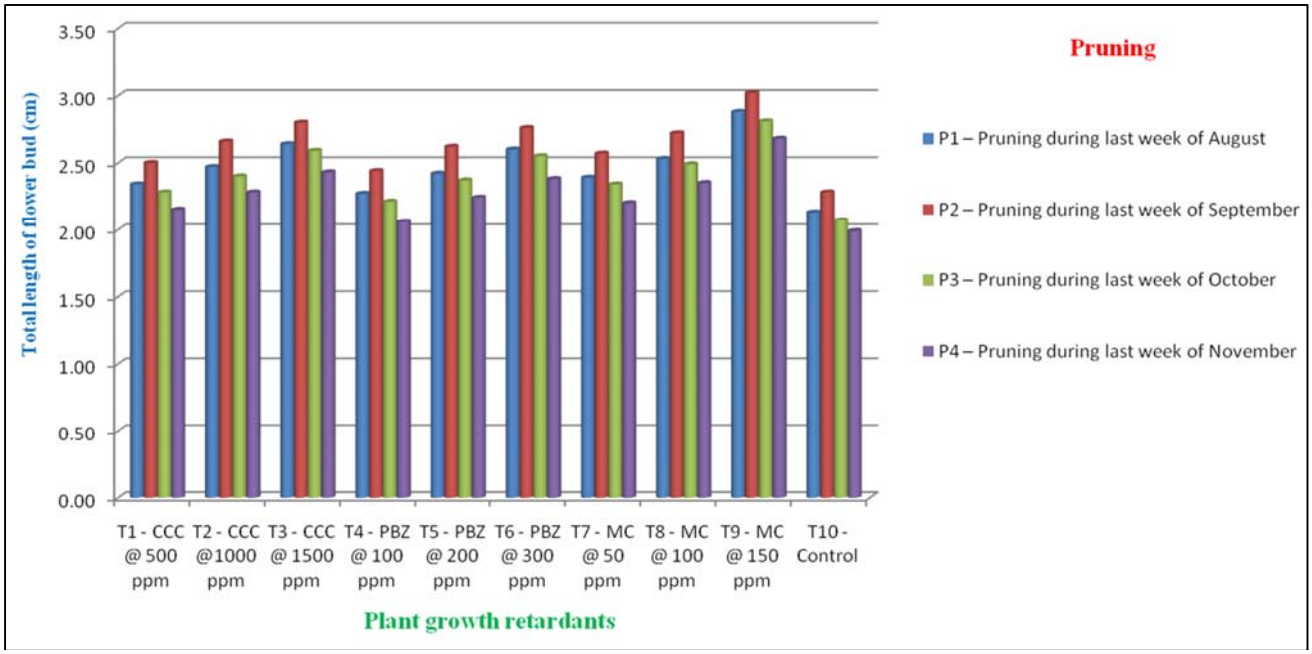

Fig 1: Effect of pruning and plant growth retardants on total length of flower bud in *Jasminum sambac* L. during off season (December to February)

The flower quality parameters *viz*., total length of flower bud (2.64 and 2.85 cm), length of flower bud without corolla tube (1.37 and 1.47 cm), corolla tube length (1.27 and 1.38 cm) and diameter of flower bud (0.87 and 1.00 cm) were influenced significantly by both pruning and growth retardants treatments. The treatment comprises of pruning during last week of September and spraying mepiquat chloride @ 150 ppm respectively. These results are in agreement with the findings of Sujatha *et al*. (2009) [3] and Jennoah, 2012 [4] in *Jasminum sambac*. The better flower quality resulted in September pruned plants might be due to of better vegetative growth and the production of larger quantities of reserve food in comparison to the plants pruned during other months. Pruning is an important tool for manipulation of flowering as it influences flower bud initiation, differentiation and ultimately the flower production. These results are in conformity with the findings of Rajesh (1995) [5] in calendula, Sainath (2009) [6] in annual chrysanthemum and Kalicharan (2012) [7] in moringa. This might be due to their inhibitory role on cell division and cell elongation of apical meristematic cells as an anti-gibberellin compound. Mepiquat chloride can restrict vegetative growth, inducing the plant to direct more carbohydrates to the reproductive organs. Hence, the vegetative growth was restricted which favours stored carbohydrates and other nutrients to play their role on flowering.

The interactions between four different times of pruning and foliar spray of growth retardants were not significant in respect of flowering parameters *viz*., total length of flower bud, length of flower bud without corolla tube, corolla tube length and diameter of flower bud.

Table 1: Effect of pruning and plant growth retardants on flower quality characters of *Jasminum sambac* L. during off season (December - February)

Treatments	Length of flower bud without corolla tube (cm)				Mean	Corolla tube length (cm)				Mean	Diameter of flower bud (cm)				Mean
	P_1	P_2	P_3	P_4		P_1	P_2	P_3	P_4		P_1	P_2	P_3	P_4	
T_1 - CCC @ 500 ppm	1.24	1.31	1.21	1.10	1.22	1.10	1.19	1.07	1.05	1.10	0.69	0.80	0.63	0.58	0.68
T_2 - CCC @ 1000 ppm	1.27	1.38	1.23	1.17	1.26	1.20	1.28	1.17	1.11	1.19	0.87	0.90	0.79	0.75	0.83
T_3 - CCC @ 1500 ppm	1.37	1.45	1.34	1.25	1.35	1.27	1.35	1.25	1.18	1.26	0.94	0.96	0.89	0.86	0.91
T_4 - PBZ @ 100 ppm	1.20	1.28	1.17	1.09	1.19	1.07	1.16	1.04	0.97	1.06	0.65	0.75	0.60	0.56	0.64
T_5 - PBZ @ 200 ppm	1.25	1.36	1.23	1.15	1.25	1.17	1.26	1.14	1.09	1.17	0.81	0.87	0.74	0.74	0.79
T_6 - PBZ @ 300 ppm	1.34	1.43	1.31	1.22	1.33	1.26	1.33	1.24	1.16	1.25	0.93	0.95	0.87	0.84	0.90
T_7 - MC @ 50 ppm	1.25	1.34	1.22	1.13	1.24	1.14	1.23	1.12	1.07	1.14	0.79	0.84	0.71	0.69	0.76
T_8 - MC @ 100 ppm	1.31	1.41	1.29	1.19	1.30	1.22	1.31	1.20	1.16	1.22	0.90	0.93	0.83	0.79	0.86
T_9 - MC @ 150 ppm	1.49	1.57	1.45	1.38	1.47	1.39	1.45	1.36	1.30	1.38	1.02	1.05	0.98	0.94	1.00
T_{10} - Control	1.10	1.19	1.06	1.03	1.10	1.03	1.09	1.01	0.96	1.02	0.56	0.61	0.55	0.47	0.55
Mean	1.28	1.37	1.25	1.17		1.19	1.27	1.16	1.11		0.82	0.87	0.76	0.72	
	SEd		CD (P=0.05)			SEd		CD(P=0.05)			SEd		CD (P=0.05)		
P	0.03		0.07			0.03		0.06			0.02		0.04		
T	0.05		0.11			0.05		0.10			0.03		0.07		
P×T	0.11		NS			0.10		NS			0.07		NS		

P1 – Pruning during last week of August P3 – Pruning during last week of October
P2 – Pruning during last week of September P4 – Pruning during last week of November

3.2. Effect of pruning and plant growth retardants on the biochemical parameters of *Jasminum sambac* (L.)

Data recorded on biochemical traits *viz*., chlorophyll index, total phenol content and soluble protein were influenced by pruning, growth retardants and their interaction effect (Table 2).

The biochemical parameters *viz*., chlorophyll index (48.42, 52.49 and 59.77 SPAD value), total phenol content (1.77, 2.11 and 2.48 mg g^{-1}) and soluble protein content (13.49, 14.55 and 16.95 mg g^{-1}) were influenced significantly by plants pruned during last week of September with the foliar spray of mepiquat chloride @ 150 ppm. The interaction effect also showed the same results. Here, it could be noticed that pruning, growth retardants and their interaction effect were positively influenced over the biochemical traits of *Jasminum sambac*. The highest level of chlorophyll, total phenol content and soluble protein content observed in the plants pruned during last week of September might be due to the improved photosynthetic efficiency which ultimately resulted in improved flower quality and yield potential. Similar results were obtained by Kumaresan, 2016 [8] in jasmine and Kalicharan, 2012 [7] in moringa. Mepiquat chloride recorded the high levels of chlorophyll index, total phenol content and soluble protein content of leaves which might be due to the increased synthesis of carbohydrates and protein and translocation of photosynthates from source to sink. The biochemical traits due to mepiquat chloride application were found to increase the flower quality parameters and yield. This is in agreement with the earlier findings by Xu and Tylor (1992) [9] in cotton and Sathiya Bama (1999) [10] in potato. Similar results were also observed in moringa by Vijayakumar (2001) [11], Anbarasu (2009) [12] and Kalicharan (2012) [7].

4. Conclusion

Considering the above results, it was observed that the plants pruned during last week of September and sprayed with Mepiquat chloride @ 150 ppm influenced significantly on flower quality parameters *viz*., total length of flower bud, length of flower bud without corolla tube, corolla tube length and diameter of flower bud over the check in *Jasminum sambac* during off season (December to February).

Table 2: Effect of pruning and plant growth retardants on biochemical characters of *Jasminum sambac* L. during off season (December to February)

Treatments	Chlorophyll index SPAD value				Mean	Total phenol content (mg g^{-1})				Mean	Soluble protein (mg g^{-1})				Mean
	P_1	P_2	P_3	P_4		P_1	P_2	P_3	P_4		P_1	P_2	P_3	P_4	
T_1 - CCC @ 500 ppm	38.01	45.65	37.39	36.05	39.28	1.46	1.50	1.39	1.31	1.42	11.72	12.59	10.84	10.47	11.41
T_2 - CCC @1000 ppm	43.47	49.30	40.03	39.90	43.18	1.66	1.89	1.62	1.54	1.68	12.56	13.42	11.61	11.15	12.19
T_3 - CCC @ 1500 ppm	46.72	50.46	46.90	44.10	47.05	1.87	2.06	1.92	1.87	1.93	13.42	14.02	12.31	12.00	12.94
T_4 - PBZ @ 100 ppm	37.50	43.60	36.10	35.43	38.16	1.41	1.43	1.33	1.24	1.35	11.64	12.26	10.48	10.16	11.14
T_5 - PBZ @ 200 ppm	41.57	47.94	38.41	38.08	41.50	1.60	1.72	1.53	1.45	1.58	12.33	13.18	11.35	10.89	11.94
T_6 - PBZ @ 300 ppm	45.03	50.09	44.02	42.31	45.36	1.75	1.93	1.79	1.72	1.80	13.02	14.06	12.18	11.73	12.75
T_7 - MC @ 50 ppm	39.70	46.08	38.27	36.69	40.19	1.54	1.68	1.46	1.37	1.51	11.98	12.94	11.17	10.68	11.69
T_8 - MC @ 100 ppm	45.82	49.81	44.01	41.62	45.32	1.72	1.91	1.77	1.68	1.77	12.78	13.87	11.93	11.48	12.52
T_9 - MC @ 150 ppm	51.82	59.77	49.65	48.70	52.49	2.15	2.48	2.05	1.94	2.11	14.1	16.95	13.78	13.37	14.55
T_{10} - Control	33.93	41.49	31.71	30.93	34.52	1.15	1.18	1.11	1.06	1.13	11.29	11.63	10.32	10.02	10.82
Mean	42.36	48.42	40.65	39.38		1.63	1.77	1.60	1.52		12.48	13.49	11.60	11.20	
	SEd		CD (P=0.05)			SEd		CD(P=0.05)			SEd		CD (P=0.05)		
P	1.20		2.43			0.04		0.09			0.68		0.91		
T	1.90		3.84			0.07		0.14			1.08		1.45		
P×T	3.80		7.69			0.14		0.29			2.16		2.90		

P1 – Pruning during last week of August P3 – Pruning during last week of October
P2 – Pruning during last week of September P4 – Pruning during last week of November

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